Important Dates
Last date for online registration: July 20, 2018
Course dates: 23 July - 27 July, 2018
Course Details can be viewed at
http://portal.iitb.ac.in/ceqipapp

Venue for Course:
Victor Menezes Convention Centre (VMCC), IIT Bombay.

Date & Time of Desk Registration:
15 July 2018, 8 AM at course venue, IIT Bombay.

REGISTRATION
All the participants have to register for the course online at the following registration portal
http://portal.iitb.ac.in/ceqipapp

Although there is no registration fee for the course, participants are required to confirm their participation by paying ₹2000/- online through the above portal. The amount will be refunded to the participant if she / he attends the course. In case a participant does not attend the course, the above amount will be forfeited.

Eligibility
Faculty members of degree level engineering colleges recognized by AICTE, are eligible to attend the course.

Transport, Boarding & Lodging
Participants are entitled for Second Class (Sleeper Class) or III AC railway fare to and fro by the shortest route from college to IIT Bombay. All participants will be given auto fare from Kanjurmarg/Andheri to IIT on the dates of arrival and departure. Local participants will be paid second class railway fare or BEST Bus fare.

Boarding and lodging will also be provided free of cost. Accommodation will be provided in the students Hostels or Guest House on sharing basis. Since accommodation is limited, family members of the participants cannot be accommodated.

Quality Improvement Programme (QIP)
Short Term Course
Medical Image Computing: Machine Learning Methods and Advanced-MRI Applications
23 July – 27 July 2018

Course Coordinator
Prof. Suyash P. Awate
https://www.cse.iitb.ac.in/~suyash

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Introduction: Medical imaging is increasingly being used as a first step for clinical diagnosis of a large number of diseases, including disorders of the brain, heart, lung, kidney, muscle etc. Among the modalities that finds widespread use is magnetic resonance imaging (MRI), due its ability to image bones as well as soft tissue. In the case of major abnormalities such as tumors, a radiologist can easily spot abnormalities in the MR images. However, subtle changes in the tissue are difficult to locate for the human eye. Hence, advanced image processing techniques can be of great medical value to assist the radiologist as well as to understand basic mechanism of action in a large number of diseases. Further, early diagnosis is critical for better clinical outcome.

Image processing is a key tool that finds application not only in the clinic but also in telemedicine, where images acquired remotely can be processed on an application server to assist in quick and effective diagnosis without the patient having to travel long distances. Thus, the application of image processing in medicine is critical to improving the healthcare facilities in India.

This course is designed as an introductory course in medical image processing and analysis for engineers and quantitative scientists and faculty. It will primarily focus on MR imaging and analysis with special emphasis on brain and mental disorders. Apart from the basics such as edge detection and segmentation, we will also cover advanced concepts such as shape analysis, probabilistic clustering, nonlinear dimensionality reduction, and diffusion MRI processing. This course will also have several hands-on segments that will allow the students to get a first-hand feel of the opportunities and challenges in medical image analysis.

Course Outline: The primary objectives of the course are as follows:

i) Exposing the participants to the clinical problems in radiomics and MR image computing.
ii) Providing exposure to participants on the mathematical tools used in medical image computing.
iii) Giving hands-on and project experience to all participants on utilizing and applying the tools to some practical problems in medical imaging.
iv) The participants will be able to appreciate the opportunities and challenges in medical image processing and their potential for use in the clinical realm.

Course contents include:

Types of medical imaging modalities (MRI, PET, Ultrasound, CT), imaging nomenclature (sagittal, axial, coronal), acquisition, reconstruction, clinical application.

Images in Matlab, Fourier series, Fourier transform, Fast Fourier transform, convolution, sampling theory, interpolation, aliasing.

Image enhancement, denoising, deblurring, edge detection, anisotropic diffusion. Introduction to image registration, transforms, least-squares based registration metric, mutual information.

Introduction to image segmentation, clustering algorithms, statistical mixture models, expectation maximization (EM). Introduction to level-set methods for segmentation, implementing level-set based algorithms.

Dimensionality reduction including principal component analysis (PCA) and kernel methods, statistical shape analysis. Nonlinear PCA for high dimensional data, use for denoising, level-set based shape representation.

Basics of diffusion MRI, visualizing and analyzing diffusion tensor images (DTI of the brain), DTI derived measures. Advanced processing and tractography. DTI in mental disorders.

Course Evaluation

Successful participants would be awarded a ‘Course Participant Certificate’.

We are grateful for support from the Wadhwani Research Centre for Bioengineering (WRCB) at IIT Bombay.